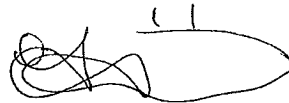


DECLARATION

I, the undersigned, Yoko OISHI, located at 2nd Floor, Kyohan Building, 2-7, Kandanishiki-cho, Chiyoda-ku, Tokyo 101-0054, JAPAN, do solemnly and sincerely declare that I fully understand the Japanese Language and the English Language and that the attached translation from the Japanese Language to the English Language of Japanese Patent Application No. 2002-289469 filed on October 2, 2002, (Reference Number: 540685JP01) is a true, correct and good-faith translation to the best of my knowledge and belief.

Dated this 19th day of April, 2011

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke at the end.

Yoko OISHI

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[Necessity of Proof]	Necessary	

[Name of the Document]

SPECIFICATION

[Title of the Invention]

COMMUNICATION ADAPTER

[Claims]

[Claim 1]

A communication adapter characterized by comprising:

an input/output interface that is connected to a home appliance;

a network interface that is connected to a network;

a CPU that is connected to the interfaces and performs exchange and processing of data; and

a storage that saves the data, and

in that the storage has plural pieces of driver software for controlling hardware of the input/output interface for each input/output system and,

when the input/output interface is connected to the home appliance, the CPU distinguishes an input/output system for the home appliance on the basis of voltage information supplied from the home appliance via a specific terminal of the input/output interface and selects driver software corresponding to the input/output system.

[Claim 2]

A communication adapter characterized by comprising:

an input/output interface that is connected to a home appliance;

a network interface that is connected to a network;

a CPU that is connected to the interfaces and performs exchange and processing of data; and

a storage that saves the data, and

in that the storage has plural pieces of driver software for controlling hardware of the input/output interface for each input/output system,

the input/output interface includes a second specific terminal that supplies a clock signal from the communication adapter to the home appliance, and

the CPU starts driver software of a serial input/output system of a clock

synchronous type/asynchronous type in association with supply/non-supply of the clock signal and, on the basis of a response returned from the home appliance at this point, selects driver software of the serial input/output system of one of the clock synchronous type/asynchronous type.

[Claim 3]

A communication adapter characterized by comprising:
an input/output interface that is connected to a home appliance;
a network interface that is connected to a network;
a CPU that is connected to the interfaces and performs exchange and processing of data; and
a storage that saves the data, and
in that the storage has plural pieces of driver software for controlling hardware of the input/output interface for each input/output system, and
the communication adapter selects driver software held by the storage on the basis of a communication frame that is sent from an electrical apparatus connected to the network.

[Claim 4]

A communication adapter characterized by comprising:
an input/output interface that is connected to a home appliance;
a network interface that is connected to a network;
a CPU that is connected to the interfaces and performs exchange and processing of data; and
a storage that saves the data, and
in that the storage has plural pieces of driver software for controlling hardware of the input/output interface for each input/output system, the storage holds attribute information including items, model names, power consumption, and the like, which can be monitored, controlled, and set from the network, for each of plural home appliances, and
the communication adapter selects one piece of the attribute information for the

input/output interface on the basis of a response frame from the home appliance responding to the communication frame sent from the input/output interface to the home appliance.

[Claim 5]

A communication adapter characterized by comprising:
an input/output interface that is connected to a home appliance;
a network interface that is connected to a network;
a CPU that is connected to the interfaces and performs exchange and processing of data; and
a storage that saves the data, and
in that the storage has plural pieces of driver software for controlling hardware of the input/output interface for each input/output system, the storage holds attribute information including items, model names, power consumption, and the like, which can be monitored, controlled, and set from the network, for each of plural home appliances, and
the communication adapter selects one piece of the attribute information on the basis of a communication frame sent from an electrical apparatus connected to the network.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to a communication adapter that connects, in particular, electrical apparatuses to a network with respect to a domestic control system controlling a home appliance in a house.

[0002]

[Prior Art]

In a conventional domestic control system, when attribute information (model names, power consumption, etc.) concerning loads such as air conditioners and lights is set in a communication adapter or when the attribute information set in the

communication adapter is changed because of extension or the like of the system, code numbers of the loads have to be set using a DIP code switch every time the attribute information is changed (refer, for example, to Patent Reference 1). Since such setting using the DIP code switch is complicated work, a domestic control system, which sets code numbers in a communication adapter using barcodes and a barcode reader, has been proposed (Refer, for example, to Patent Reference 2).

[0003]

[Patent Reference 1]

Japanese Published Unexamined Patent Application No. H01-228395 (page 3, Fig. 2)

[Patent Reference 2]

Japanese Published Unexamined Patent Application No. H06-68097 (Fig. 1)

[Problem to be Solved by the Invention]

[0004]

Since the conventional communication adapter is constituted as described above, for the setting of attribute information such as model names and power consumption of connected home appliances and the change of setting involved in extension of the system, the barcodes and the barcode reader are required and time and labor consuming work using the barcodes and the barcode reader is required.

[0005]

The invention has been devised in order to solve such problems and the objective of the invention is to provide a communication adapter that can automatically set attribute information on home appliances without using barcodes and a barcode reader and, even if the attribute information is changed, can change the attribute information easily without using the barcodes and the barcode reader.

[0006]

[Means for Solving the Problem]

A communication adapter according to the invention includes: an input/output interface that is connected to a home appliance; a network interface that is connected to

a network; a CPU that is connected to the interfaces and performs exchange and processing of data; and a storage that saves the data, wherein the storage has plural pieces of driver software for controlling hardware of the input/output interface for each input/output system and, when the input/output interface is connected to the home appliance, the CPU distinguishes an input/output system for the home appliance on the basis of voltage information supplied from the home appliance via a specific terminal of the input/output interface and selects driver software corresponding to the input/output system.

[0007]

[Embodiment of the Invention]

First embodiment

Fig. 1 is a diagram of a system using a communication adapter according to a first embodiment of the invention.

In the figure, a connector A1 disposed in a home appliance 8. The home appliance 8 exchanges attribute information with the communication adapter 2 via the connector A1. This connector will be hereinafter referred to as an input/output interface (an input/output I/F).

The communication adapter 2 includes input/output interfaces A7 and B3 for exchanging attribute information with the home appliance 8, a network interface 5 for exchanging information with an electronic appliance 10 such as other home appliances and a personal computer via a network 9 such as Ethernet (registered trademark), a CPU 6 that exchanges information between the input/output interfaces A7 and B3 and the network interface 5 and processes this information, and a storage 4 that is applicable to input/output systems used in home appliances connected to the input/output interfaces A7 and B3 and in which driver software A and B for controlling hardware of the input/output interfaces are stored.

[0008]

The input/output interfaces A and B are connectors of the same type. Formats corresponding to the input/output systems of the home appliances connected thereto are

selected as formats of the input/output interfaces A and B. Here, for simplification of explanation, it is assumed that one of formats of serial input/output and contact input/output is selected.

Fig. 2 shows a state in which two home appliances 8 and 8' with different input/output systems are connected to the communication adapter 2. In the figure, input/output interfaces of the home appliances 8 and 8' correspond to the serial input/output format and the contact input/output format, respectively.

A power supply for an interface is provided for the home appliance 8 including the interface of the serial input/output format. The power supply supplies a power supply voltage signal to a specific terminal of the input/output interface (hereinafter referred to as "specific terminal").

[0009]

Next, an operation of the communication adapter 2 will be explained with reference to Figs. 1 and 2.

The CPU 6 checks whether a power supply voltage signal is supplied to specific terminals of plural input/output interfaces (in Fig. 2, two input/output interfaces A7 and B3), respectively. When home appliances are connected to the input/output interfaces and a power supply voltage signal is detected from the checked specific terminals, the CPU 6 judges that an input/output format of the connected home appliance 8 is the serial input/output format and starts driver software A, which controls hardware of an interface of the serial input/output format, stored in the storage 4. According to the start of this driver software A, the communication adapter 2 communicates with the connected home appliance 8 and reads out attribute information from the home appliance 8. This attribute information is stored in the storage 4 via the CPU 6. The stored attribute information is utilized for accessing the home appliance 8 to obtain and control various kinds of information.

[0010]

On the other hand, when a home appliance is connected to the input/output interfaces and a power supply voltage signal is not detected from the checked specific

terminal, the CPU 6 judges that an input/output format of the connected home appliance 8' is the contact input/output format. Then, the CPU 6 causes the connected input/output interface to start the driver software B for controlling the interface hardware of the contact input/output format stored in the storage 4. According to the start of the driver software B, the communication adapter 2 communicates with the connected home appliance 8' and reads out attribute information such as an apparatus model and power consumption from the home appliance 8'. This attribute information is stored in the storage 4 via the CPU 6. The stored attribute information is utilized for accessing the home appliance 8' to obtain and control various kinds of information.

[0011]

With such a structure, a format of an input/output interface corresponding to a home appliance connected to the communication adapter 2 is judged and driver software for controlling an interface hardware corresponding to the input/output interface is started.

According to the start of the driver software, attribute information concerning the connected home appliance is stored in the storage 4 via the CPU 6. In this way, it is possible to automatically set the attribute information in the communication adapter 2 without using a barcode and a barcode reader.

Note that, although the two input/output interfaces A7 and B3 are provided in the communication adapter 2 in the explanation of the figure, the same holds true for a communication adapter including two or more input/output interfaces. In addition, it is also possible to judge a format of an input/output interface according to the same method when there are input/output formats other than the serial input/output format and the contact input/output format.

[0012]

Second embodiment

In the explanation of the first embodiment, the CPU judges whether an input/output format of a connected home appliance is the serial input/output or the contact input/output and acquires attribute information of the home appliance.

In an explanation of this embodiment, only when an input/output interface of a

connected home appliance is the serial input/output format, the CPU judges whether the input/output interface is a clock synchronous type or a clock asynchronous type and acquires attribute information of the home appliance.

Fig. 3 shows a state in which the home appliance 8 including a serial input/output interface of the clock synchronous type and the communication adapter 2 are connected. In the figure, VCC, TX, RX, GND, and CLK represent a power supply voltage signal terminal, a transmission signal terminal, a reception signal terminal, a ground terminal, and a clock signal terminal.

[0013]

Here, in home appliances of the serial input/output format, a home appliance of the clock synchronous type cannot perform serial communication unless a clock signal is supplied from the communication adapter 2. However, a home appliance of the clock asynchronous type is capable of performing serial communication even if a clock signal is not supplied from the communication adapter 2. Therefore, as shown in Fig. 3, a specific CLK terminal for supplying a clock signal is set in an input/output interface such that a communication sequence is established even when a serial input/output interface of the clock synchronous type is connected.

[0014]

Next, an operation of the communication adapter 2 will be explained.

After judging a serial input/output format of a home appliance according to the method described in the first embodiment, the CPU 6 starts driver software of the clock asynchronous type that can communicate with the home appliance without a clock signal and tries communication with the home appliance without supplying a clock signal to the CLK terminal.

As a result, if it is confirmed that a normal communication sequence can be realized, the CPU 6 judges that the home appliance is the clock asynchronous type and continues the communication without changing the driver software.

[0015]

On the other hand, when the CPU 6 cannot communicate with the home appliance,

the CPU 6 changes the driver software to the clock synchronous type on the communication adapter side, supplies a clock signal to the home appliance via the CLK terminal, and tries communication. In this way, the communication adapter 2 judges whether the serial input/output format is the clock synchronous type or the clock asynchronous type, and automatically switches the clock synchronous type and the clock asynchronous type.

[0016]

After the clock synchronous type and the clock asynchronous type are switched, the communication adapter 2 communicates with the home appliance 8' connected to the communication adapter 2 and reads out attribute information such as a model name and power consumption. This attribute information is stored in the storage apparatus 4 via the CPU 6. The stored attribute information is utilized for accessing the home appliance 8' to obtain and control various kinds of information. In this way, it is possible to automatically set the attribute information in the communication adapter 2 without using a barcode and a barcode reader.

Note that, although the two input/output interfaces A7 and B3 are provided in the communication adapter 2 in the explanation of the figure, the same holds true for a communication adapter including two or more input/output interfaces.

[0017]

Third embodiment

In the explanation of the first and the second embodiments, the communication adapter 2 judges an input/output format or clock synchronous/clock asynchronous of a connected home appliance, and then, the communication adapter 2 acquires attribute information of the home appliance

In an explanation of this embodiment, after attribute information is acquired, it becomes necessary to change the attribute information because of extension of a system or it becomes necessary to perform monitoring and control.

In this embodiment, attribute information is changed from an electrical apparatus such as a personal computer via the network 9 without using a barcode and a barcode

reader. In a connection form shown in Fig. 1, attribute information and driver software for the home appliance 8 are changed, monitored, and controlled from an electrical apparatus 10 connected to the network 9. An operation in this embodiment will be explained.

[0018]

First, it will be explained how attribute information and driver software stored in the storage 4 are changed when the attribute information and the driver software are known for an electrical apparatus connected to a network.

In this case, it is sufficient to transmit a transmission frame (telegram), in which the attribute information and the driver software to be changed are described, to the communication adapter 2 from the electrical apparatus connected to the network.

For example, the CPU 6 having received this telegram ends the drive software in use immediately and reads out designated driver software out of a driver software group stored in the storage 4 and starts the driver software.

If the attribute information and the driver software stored in the storage 4 are known in this way, it is possible to change the attribute information and the driver software easily only by transmitting a telegram from the electrical apparatus connected to the network without using a barcode and a barcode reader.

[0019]

Next, it will be explained how attribute information and driver software stored in the storage 4 are changed when the attribute information and the driver software are unknown for an electrical apparatus connected to a network.

In this case, the communication adapter 2 needs to check and disclose to the network 9 what is the home appliance 8 connected to the communication adapter 2, what kind of information the home appliance 8 can receive, and what kind of monitoring and control the home appliance 8 can perform.

[0020]

Fig. 4 shows a procedure for disclosing attribute information of the connected home appliance 8 to the network 9.

The procedure will be hereinafter explained assuming that control programs for various home appliances are stored in the storage 4 of the communication adapter 2.

First, after the home appliance 8 is connected to the communication adapter 2, the communication adapter 2 generates a request frame 1 (a home appliance information acquisition request 1), which includes a request for acquiring information on the home appliance 8, and transmits the request frame 1 to the home appliance 8 via the input/output interface A7 and waits for a response to this request frame 1 from the home appliance 8 (step S1).

[0021]

When the home appliance 8 receives the request frame 1, the home appliance 8 returns a name (a code number) of the home appliance 8 itself to the communication adapter 2. The communication adapter receives the code number returned from the home appliance (step S2), extracts a control program corresponding to the home appliance out of the control program group stored in the storage 4 and sets the control program.

[0022]

Through this step, the communication adapter 2 can learn what is the home appliance 8 connected to the input/output interface A7 and set attribute information concerning the home appliance 8 and information that the communication adapter 2 can monitor and control.

Such a step is performed in parallel for all input/output interfaces of the communication adapter. The communication adapter can set attribute information concerning all home appliances connected to the communication adapter itself and information that the communication adapter can monitor and control.

[0023]

Next, consideration is given to changing, monitoring, and control of attribute information of a home appliance connected to the communication adapter 2, in which information is set as described above, from the electrical apparatus 10 connected to the network 9.

In this case, first, the electrical apparatus 10 generates a request frame 2 (a home appliance information acquisition request 2) including a request for acquiring information concerning a home appliance connected to a communication adapter and sends the request frame 2 to the communication adapter 2.

[0024]

The communication adapter 2 generates a response frame (a home appliance attribute information response) as a response to the request frame 2 (the home appliance information acquisition request) on the basis of attribute information of all connected home appliances and information with which the home appliance can be monitored and controlled, and returns the response frame to the request frame 2. According to the response frame from the communication adapter, the electrical apparatus 10 can judge what kind of home appliance 8 is connected to the network 9 and can acquire attribute information concerning the home appliance 8 and information with which the home appliance 8 can be monitored and controlled (step S3). Then, to change the attribute information on the home appliances and monitoring and control of the home appliances on the basis of the acquired information, it is sufficient to transmit a telegram describing contents of the charge as in the above-mentioned case in which attribute information is known.

[0025]

In this way, it is possible to change the attribute information on the home appliances connected to the communication adapter and monitor and control the home appliances from the electrical apparatus 10 connected to the network 9 on the basis of the acquired information without using a barcode and a barcode reader.

[0026]

Note that, in this explanation, a control program group for various home appliances is stored in the storage 4 of the communication adapter 2 and an electrical apparatus, to which the communication adapter is connected, is judged via input/output interfaces between the communication adapter and the home appliances. However, it is also possible to transmit a frame, which sets a home appliance connected to an input/output

interface of the communication adapter, to the communication adapter 2 from an electrical apparatus such as a personal computer connected to the network 9. In this way, it is possible to set and change a control program for the pertinent home appliance and establish a response frame on the basis of the transmitted frame.

[0027]

[Effects of the Invention]

As described above, in the communication adapter according to the invention, when an input/output interface of the communication adapter and an input/output interface of a home appliance are connected, a CPU of the communication adapter sets driver software for controlling interface hardware stored in a storage on the basis of power supply voltage information supplied from the home appliance via a specific terminal of the input/output interface. Thus, it is possible to automatically set attribute information without using a barcode and a barcode reader.

[Brief Description of the Drawings]

[FIG. 1]

A system diagram showing a relation among a communication adapter, a home appliance, and a network according to a first embodiment of the invention.

[FIG. 2]

A diagram showing a state in which two home appliances with different input/output systems are connected to a communication adapter according to the first embodiment of the invention.

[FIG. 3]

A diagram in which a home appliance with an input/output interface of a clock synchronization type is connected to a communication adapter according to a second embodiment of the invention.

[FIG. 4]

A diagram showing a procedure for referring, from a network, to a home appliance connected to a communication adapter according to the first embodiment of the invention.

[Explanation of Reference Numerals]

- 1: Input/output interface A
- 2: Communication adapter
- 3: Input/output interface B
- 7: Input/output interface A
- 8: Home appliance
- 9: Network
- 10: Electrical apparatus

[Name of Document] Abstract

[Abstract]

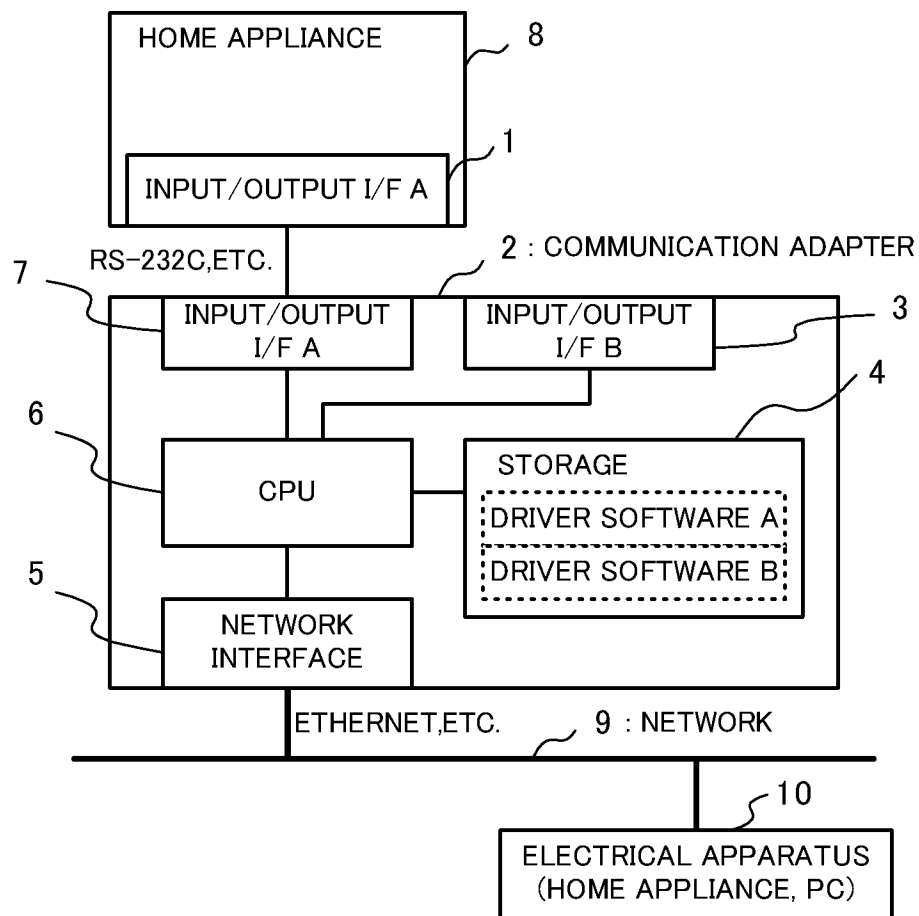
[Object] To obtain a method of automatically setting, for example, information (model names or power consumption) of a home appliance connected to a communication adapter without any human-included behavior such as switching on and off.

[Solution] A communication adapter is constituted of: an input/output interface that is connected to a home appliance; a network interface that is connected to a network; a CPU that is connected to the interfaces and performs exchange and processing of data; and a storage that saves the data, where the storage has plural pieces of driver software for controlling hardware of the input/output interface for each input/output system and, when the input/output interface is connected to the home appliance, the CPU distinguishes an input/output system for the home appliance on the basis of voltage information supplied from the home appliance via a specific terminal of the input/output interface and selects driver software corresponding to the input/output system.

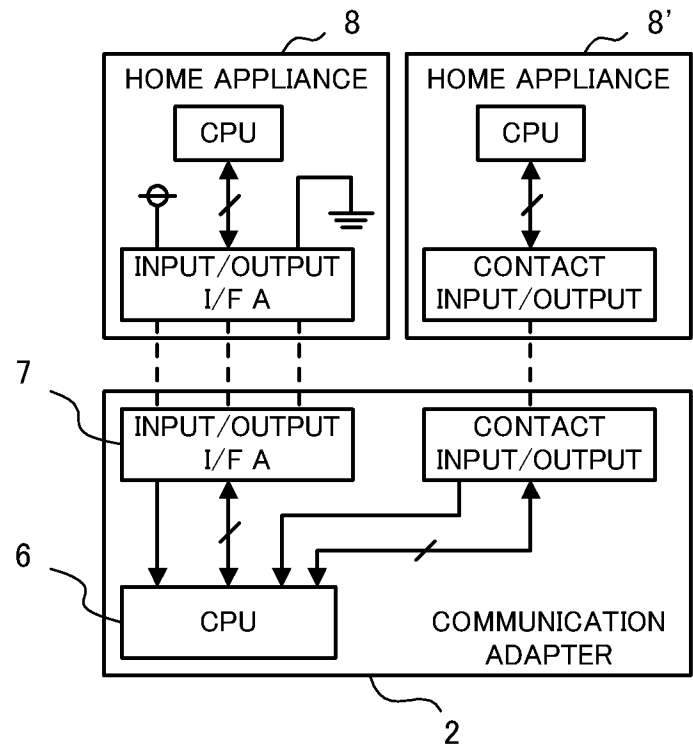
[Selected Drawing] FIG. 1

[Name of The Document] DRAWINGS

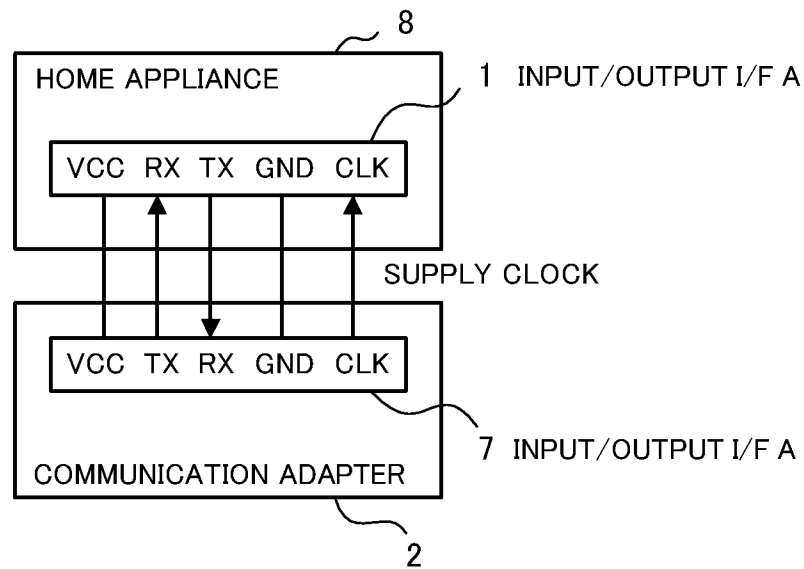
[FIG.1]



[FIG.2]



[FIG.3]



[FIG.4]

